FINAL
Work Order

Wendkirk Oil Field
Phase II Investigation
Coke County, Texas

Prepared for:

Railroad Commission of Texas
Oil and Gas Division
Site Remediation and Special Response

John Tintera, Project Manager

Prepared by:

TRC
505 East Huntland Drive, Suite 250
Austin, TX 78752

Mark Robbins, Senior Project Manager

May 2006

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TRC Project No. 51833

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1.0 INTRODUCTION

The Total Maximum Daily Load (TMDL) Section of the Texas Commission on Environmental Quality (TCEQ) placed Segment 1426 of the Upper Colorado River on the State's 303(d) list because it does not meet water quality standards due to high salinity. Segment 1426 is located between E. V. Spence Reservoir and O. H. Ivie Reservoir in Coke and Runnels Counties. In addition, previous analyses of the salinity of the Colorado River have been reported to indicate that concentrations increase downstream of the Wendkirk Oil Field.

The Railroad Commission of Texas (RRC), Oil and Gas Division has received a Section 319 Non-Point Source grant from the United States Environmental Protection Agency (USEPA) through the TCEQ to determine if oil and gas operations in the Wendkirk Oil Field are contributing to the high saline water. The overall objective of the complete project is to locate the nature and extent of the source(s) leading to the high salinity in the Colorado River and to evaluate best management practices to abate the source(s).

As part of a TCEQ TMDL project, an airborne geophysical survey of Segment 1426 was conducted by the University of Texas Bureau of Economic Geology (BEG) for the TCEQ. This survey indicated four areas of elevated ground conductivity along the Upper Colorado River. The most upstream area, referred to as the Machae Creek Area, is the subject of the investigation presented in this work order. Within the Machae Creek Area, the Colorado River is 12.4 miles long and has several intermittent tributaries. The Wendkirk Oil Field is located at the downstream extent of the Machae Creek Area.

In December 2005, TRC conducted a preliminary investigation with the objective of reviewing available data and conducting a site reconnaissance to support development of this work order. This work order presents the proposed Phase II investigation activities based on the recommendations identified in the preliminary investigation memorandum dated April 20, 2006. The information gathered from both the preliminary and Phase II investigations will be used to address the overall project objective of determining the nature and extent of oil and gas (O&G) exploration and production (E&P) source(s), if found, that lead to the high salinity in the Wendkirk Oil Field portion of the Machae Creek Area of the Colorado River.

This Work Order overviews a plan for gathering, analyzing, and reporting investigation data, in order to achieve the project objective by performing nine tasks. These tasks are numbered one through nine. Tasks one through nine will be implemented in succession with each task being at least partially dependent on its predecessor. The scope of work for the nine tasks has been defined based on available information, and a detailed cost estimate for their execution has been prepared.

The next section outlines our understanding of the project goals and site conditions, and describes the overall technical approach. The remaining sections of the Work Order provide a description of each task, along with proposed personnel, cost, and schedule.

2.0 TECHNICAL APPROACH

This section presents an overview of the proposed scope of work for conducting the Phase II investigation at the Wendkirk Oil Field in Coke County, Texas.

2.1 Our Understanding of the Site and Project

The following outlines our understanding of the project based on information provided by the RRC as well as meetings held with the RRC and TCEQ.

In February 2005, BEG conducted an airborne geophysical survey of Segment 1426. The survey was conducted at various depths up to 54 meters (177 feet) using a multi-frequency electromagnetic induction (EM) instrument to determine the extent and intensity of salinization along the Colorado River in the project area. The data indicated four areas of elevated ground conductivity. The most upstream area, referred to as the Machae Creek Area, is the subject of the investigation presented in this work order. Within the Machae Creek Area, the Colorado River is 12.4 miles long and has several intermittent tributaries. The Wendkirk Oil Field is located at the downstream extent of the Machae Creek Area.

The BEG prepared a brief draft report in May 2005 that focused on the geophysical survey. A comprehensive report was completed and reported in September 2005. The BEG's report provided the following interpretation of the geophysical survey data from the Machae Creek Area. Elevated salinity was identified in the shallowest and two deepest exploratory intervals. The conductivity was highest in the shallow interval at the upstream three kilometers (0 to 3 kilometers) and downstream four kilometers (8 to 12 kilometers) of the Machae Creek Area. Analyses of samples from these two areas correlate with the high salinity of samples gathered from the same areas during ground-based studies. At the deeper intervals, the conductivity was highest at the downstream six kilometers (6 to 12 kilometers). The BEG attributes the increased salinity in the Colorado River within the Machae Creek Area to base-flow contributions from saline groundwater at the downstream extent of the area.

Several water wells within the Machae Creek Area were sampled and indicated two distinct geochemical properties: (1) groundwater enriched with sodium and chloride that is likely sourced from oil and gas operations and/or the San Angelo Formation, and (2) groundwater enriched with sulfate with a more even distribution of the major cations that is likely sourced from dissolution of the gypsum stratigraphic units. The BEG report suggests that the sodium-chloride rich groundwater is the primary contributor to the increased salinity in the Colorado River within the Machae Creek Area.

The BEG report also presented a discussion of surface water quality trends over the entire project area, which is summarized as follows:

- Conductivity fluctuates along the Colorado River indicative of local sources of high salinity.
- Groundwater and stream salinity show a strong correlation indicating a connection between these water systems.
- Surface water salinity is higher during low-flow conditions.
- During recent low flow conditions, the Colorado River was observed to be a gaining stream indicating that the groundwater may be contributing to the elevated salinity of the river.

TRC conducted a preliminary investigation along the Colorado River near the Wendkirk Oil Field during December 2005. The objectives of the preliminary investigation were to gather and review available data about the area, conduct a site reconnaissance, and provide recommendations to support development of this work scope for additional investigation. The preliminary investigation included completing records search/review and field reconnaissance activities (including site survey assessment, site interviews, and collection of qualitative field surface water and groundwater data). The following conclusions and recommendations for further investigation activities were made based on the data collected during this preliminary investigation of the Machae Creek Area (including the Wendkirk Oil Field) and presented in the preliminary investigation memorandum dated April 20, 2006:

- A meeting with the BEG to compare and contrast BEG's and TRC's data and develop any other recommendations.
- Evaluation of seasonal flow effects, which may include periodic sampling of key surface and groundwater locations during different flow regimes (i.e., different seasons, after precipitation events, etc.). This would also include collection of flow data into and out of the Machae Creek Area. This is recommended based on the lack of comparable conductivity data collected at adjacent locations by the BEG and TRC.
- Collect field data between segments 12 and 15 as these data were not collected during the preliminary investigation.
- Compile recent groundwater well data from the Coke County Underground Water Conservation District located in Robert Lee.

- Quarry activities along the Colorado River could potentially impact river water quality if water collected in surface ponds has high salinity due to nearby sources (e.g., mining activities) or evaporative effects, and this water is released during a high precipitation event or migrates through alluvial sediments into the river. Further investigation (i.e., water sampling) of the quarries is suggested to determine the potential for impacts.

- Increases in chloride, sodium and conductivity at Colorado River segment 8 have not been determined to be related to any specific cause so additional investigation is recommended.

- Increases in chloride, sodium and conductivity along segments 11 to 18 may be due to naturally-occurring brine but the proximity of the Wendkirk Oil Field may be sufficient reason for additional investigation. Supporting reasons for additional investigation at the Wendkirk Oil Field are concentrations at the creek that runs through Mays Ranch and spring 4314102 that are much higher than most of the surface and groundwater samples that were collected, as well as indications of surface soil impacts at a nearby SWDF. Sampling for hydrocarbons is recommended as a possible marker analyte to differentiate chloride and sodium impacts from naturally-occurring brine versus oil and gas activity.

- High conductivities in the area around Machae Creek may be due to naturally-occurring high sulfate water and are not necessarily associated with oil and gas activities.

2.2 Objectives

Based upon the results of preliminary investigation conducted by TRC, it was determined that further investigation activities are warranted. The objective of the Phase II investigation is to gather additional information that may be used to determine the nature and extent of O&G E&P source(s), if found, leading to the high salinity in the Machae Creek Area of the Colorado River.

2.3 Approach

TRC has designed this Work Order to achieve the stated objectives, thereby helping the RRC meet its ultimate goal of determining the source(s) of the elevated salinity in the Colorado River and implementing best management practices to abate the impacts of the source(s). To accomplish this objective, we have divided the Phase II investigation into nine tasks with decision points at the completion of each task. This will enable TRC and the RRC to tailor the

scope of subsequent tasks to take full advantage of information collected up to that point, thereby optimizing the remaining tasks and minimizing costs. The project scope is divided into the following tasks:

- Task 1: Data Evaluation Meeting
- Task 2: Seasonal Water Monitoring Work Plan
- Task 3: Records Search and Review
- Task 4: Seasonal Water Monitoring
- Task 5: Groundwater Investigation Work Plan
- Task 6: Groundwater Investigation – Event 1
- Task 7: Interim Technical Memorandum
- Task 8: Groundwater Investigation – Event 2
- Task 9: Investigation Report

3.0 TASK DESCRIPTIONS

3.1 Task Work Scope

Phase II investigation activities at the Wendkirk Oil Field will consist of nine tasks that are detailed in the subsequent sections. Our proposed approach includes a specific work scope and cost estimate for the nine tasks presented in Section 2.3. A project schedule for tasks one through nine is discussed in Section 3.4. The RRC will approve all decisions prior to proceeding with these tasks.

3.1.1 Task 1: Data Evaluation Meeting

The BEG, RRC, and TRC will conduct a meeting to review the results of the December 2005 preliminary investigation. The purpose of this meeting is to compare and contrast BEG's and TRC's data and develop any other recommendations, as necessary. The key points of discussion and any other recommendations will be summarized by TRC in a brief memorandum that will be submitted to the RRC.

3.1.2 Task 2: Seasonal Water Monitoring Work Plan

This task consists of developing the seasonal water monitoring approach. The work plan will describe the final approach and provide the required guidance for field personnel to complete Task 4 by including methods for estimating stream flow, a list of monitoring and sampling locations, methods for conducting monitoring and sampling, analytical requirements, data collection rationale, and quality assurance/quality control (QA/QC) requirements.

The work plan will include a Health and Safety Plan (HASP) that will establish the guidelines and procedures necessary to protect employees and subcontractors of TRC from potential safety and health hazards resulting from activities conducted in support of this project. The HASP will be written to include activities that will occur throughout the duration of the project. The HASP will be developed in conformance with directives and requirements of TRC's Corporate Health and Safety Program and with applicable Occupational Health and Safety Administration (OSHA) requirements. At a minimum, the HASP will include the following:

- Site description
- Project objectives
- Description of field activities

- List of key personnel and their responsibilities
- Medical monitoring and employee training information
- Identification of site-specific environmental hazards
- Emergency information and procedures
- Map to nearest medical facility
- Required personnel protective equipment (PPE)
- Decontamination procedures
- Sample shipping and analytical information
- Signatures of all field personnel

3.1.3 Task 3: Records Search and Review

This task consists of researching and reviewing photographs and analytical data to improve our understanding of the project area. The following specific documents or data sources will be researched, obtained and reviewed:

- Historical aerial photographs to determine former land use, especially with respect to oil and gas operations. Historical aerial photographs are available prior to and after development of the Wendkirk Oil Field, which occurred in the 1950s. Turn-around time for obtaining these photographs can take up to 8 to 12 weeks after placing the photograph order.
- The most recent map (Tobin) illustrating location of known oil/gas wells and property line boundaries for Coke County. These maps are updated quarterly.
- Coke County Underground Water Conservation District groundwater inventory and analytical data for water wells, specifically specific conductivity and dissolved-mineral concentrations in the Wendkirk Oil Field and Machae Creek areas. Due to the volume of information that must be reviewed and minimal staff available, this information must be obtained in person at the Coke County Underground Water Conservation District office in Robert Lee, Texas.

Due to the period of time it may take to obtain historical aerial photographs, the photographs will be ordered immediately upon work authorization approval. Analytical

groundwater data will be collected from the Coke County Underground Water Conservation District office in conjunction with the first seasonal water monitoring event (Section 3.1.4). Pertinent information gathered during the completion of this task will be included in the Investigation Report.

3.1.4 Task 4: Seasonal Water Monitoring

TRC will conduct three seasonal water monitoring events over the estimated five month duration of the Phase II investigation. The seasonal water monitoring consists of two subtasks estimated to take a total of two field days per event. The subtasks are described in detail below and include stream flow measurements and water sampling. The RRC will be responsible for arranging any necessary site access and obtaining permission to conduct the work scope prior to site mobilization.

During the first monitoring event, the following "one time" tasks will be completed and are estimated to take one day:

- Collect surface water data from the Colorado River between segments 12 and 15 as these data were not collected during the preliminary investigation. The samples will be analyzed in the field for chlorides and the data will be used to determine sample locations for the future monitoring events.

- Investigate the area north of Colorado River segments 7 and 8 as a potential source area for the elevated chloride concentrations at surface water sample locations SW-7-2, SW-7-3, and SW-8-1). The investigation will consist of a walking survey of the drainage basin to identify sample locations and potential sources (e.g., ponds, wells, etc.), and collection of surface water and groundwater samples. The samples will be analyzed in the field for chlorides and the data will be used to determine sample locations for the future monitoring events.

Stream Flow Measurements

During each monitoring event, stream flow will be measured at two specific points upstream and downstream of the Machae Creek Area to evaluate seasonal effects. These data will be used to determine the effect of stream flow and groundwater base flow conditions on specific conductivity and dissolved-mineral concentrations. The stream flow will be measured in units of cubic feet per second (cfs). To determine the stream flow, a cross-sectional area of the stream or river will be measured. Then the velocity of the stream is measured using a flow rate sensor. The stream flow will be calculated by multiplying the cross-sectional area by the flow velocity.

Water Sampling

Surface water and groundwater will be evaluated during the three monitoring events to evaluate seasonal effects on water chemistry, specifically specific conductivity and dissolved-mineral concentrations. Monitoring will include sampling of key surface water and groundwater locations during different flow regimes (i.e., different seasons, after precipitation events, etc.). These data will be used to further evaluate the sources contributing to elevated dissolved-mineral concentrations in the Colorado River at the Machae Creek Area. Sources to be evaluated include surface water locations along the Colorado River, SANCO Materials (SANCO) quarry, May's Ranch Creek flowing through the Wendkirk Oil Field, seeps and springs in the Wendkirk Oil Field, and accessible water wells screened within the San Angelo and/or Blaine Formations.

Surface water samples will be collected along the Colorado River, approximately one location every kilometer (i.e., per segment) from segments 7 through 17, as well as one location upstream of segment 7. Additionally, the SANCO quarry, May's Ranch Creek, May's Ranch Seep, spring 4314102, and spring 4314104 (if accessible) will be sampled. One surface water sample will be collected from a SANCO quarry collection pond located next to the Colorado River. The creek flowing through May's Ranch will be sampled at upstream and downstream locations, spring 4314102 will be sampled at the east and west seep locations, and a sample will be collected from the May's Ranch Seep. Spring 4314104 will be sampled if accessible and flowing – this spring was not located during the preliminary investigation. Conductivity, pH, and temperature of the water will be measured in the field using a direct-read meter during the time of collection. Water samples will be collected from the Colorado River using sampling devices while wading in the river or from its banks. Surface water sample locations along the Colorado River and from the creek running through May's Ranch will be marked with "T"-posts during the initial sampling event so that during subsequent monitoring events, samples will be collected from the same locations for seasonal comparability. All of the water sample locations will be surveyed for latitude and longitude coordinates using a global positioning system (GPS).

Groundwater samples will be collected from water wells 4313603 and 4313606 located on the May's Ranch property and screened in the San Angelo Formation. In addition, water wells 4314404 and 4313302 will be sampled if accessible – these wells were not located during the preliminary investigation. The wells will be sampled by manually starting the well pumps using the stock tank float valve. The well pumps are turned on by moving the float located on the inside edge of the stock tank. The groundwater sample will be collected from the pipe discharging into the ground stock tank after a brief period of purging and field parameter testing.

This work order estimates 12 locations along the Colorado River, 1 location north of the Colorado River near segments 7 and 8, 1 location at the SANCO quarry, 5 locations within the Wendkirk Oil Field (creek, spring, and seeps), spring 4313104, and up to 4 water wells will be

sampled during each monitoring event. For the purposes of this Work Order, all of the water samples will be submitted for laboratory analysis of chlorides by method E300, calcium by method EPA 6020, sulfate by method E300, sodium by method EPA 6020, and total dissolved solids (TDS) by EPA 160.1. In addition, all samples collected during the first monitoring event and all samples collected from the Wendkirk Oil Field during the two subsequent monitoring events will be submitted for analysis of total petroleum hydrocarbons (TPH) to C-35 by method TX1005 and benzene, toluene, ethylbenzene, xylenes (BTEX) by EPA method 8021. Field QA/QC samples will be collected as follows: duplicate, matrix spike, matrix spike duplicate, and equipment blank at a frequency of five-percent, and one trip blank for each cooler that has BTEX samples. The sampling will be conducted in accordance with the *Investigation and Abatement of Produced Water Impacts and Seeps to Surface Water A Non-Point Source Watershed Project Upper Colorado River Downstream of Spence Reservoir (Segment 1426) Quality Assurance Project Plan (Upper Colorado River Downstream of Spence Reservoir QAPP)*.

3.1.5 Task 5: Groundwater Investigation Work Plan

This task consists of developing the groundwater investigation approach. The work plan will describe the final approach and provide the required guidance for field personnel to complete Tasks 6 and 8 by including proposed soil boring/monitoring well locations, methods for soil and groundwater sampling, methods for well installation and well gauging, analytical requirements, utility clearance procedures, data collection rationale, and QA/QC requirements. TRC will use data collected from the preliminary investigation including visual observations, interviews, aerial photographs, and analytical data to help determine soil boring and well locations, as well as COCs for laboratory analysis.

The work plan will include the HASP that was completed for seasonal water monitoring activities. Modifications to the original HASP may be required based on changes to the scope of work and observations made during seasonal water monitoring activities.

3.1.6 Task 6: Groundwater Investigation – Event 1

The groundwater investigation will focus on both sides of the Colorado River within the Wendkirk Oil Field between segments 13 and 18 because dissolved mineral concentrations in this area were sufficiently elevated to indicate possible impacts from oil and gas activities. The groundwater investigation consists of several subtasks and is estimated to take six days. The subtasks are described in detail below and include utility clearance, marking well locations, well installation, well gauging, groundwater sampling, surveying, and managing investigation-derived waste (IDW). The RRC will be responsible for arranging site access and obtaining permission to conduct the work scope.

Utility Clearance

The location of underground utilities will be identified in the area where soil borings and monitoring wells will be completed. As required by state law, the Texas One Call System, Texas Excavation Safety System, Inc., and/or the Lone Star Notification Center will be contacted. TRC personnel will meet with utility representatives as necessary prior to commencing subsurface work. Additional utility clearance will consist of reviewing available site maps, visual inspection, and probing the sample location with a hand auger or tile probe.

Marking Well Locations

The proposed monitoring well locations will be marked with flags or stakes prior to arrival of the drilling contractor. The locations of the monitoring wells will be based on data from the preliminary investigation, the project objectives, the location of sources and potentially impacted areas, the location of underground and aboveground utilities, and physical access.

Borings

A maximum of nine borings will be completed in the Wendkirk Oil Field. The boring locations are described in the next subsection and are based on currently available data. The locations may be adjusted based on data collected during the first and second seasonal monitoring events. All of the borings will be completed using an air-rotary drill rig due to the presence of consolidated sediments at the site.

Boring lithology will be described based on soil cuttings ejected to the surface during drilling. The soil cuttings will be described based on lithology, moisture content, and notable presence of impact. The lithologic description will be in accordance with ASTM Standard D 2488, Standard Practice for Description and Identification of Soils (Visual-Manual Procedure). The soil cuttings will be field screened with a photo-ionization detector (PID) to identify volatile organic compound (VOC) vapors. Soil samples will not be submitted for laboratory analysis.

Well Installation

The borings will be converted to monitoring wells upon completion of drilling activities. The monitoring wells will be used to collect groundwater samples, as well as to gather additional information on the groundwater flow direction and gradient. Proposed monitoring well locations are as follows, however, the locations may be adjusted based on data collected during the first and second monitoring events:

- Three monitoring wells will be installed in the area surrounding spring 4314102 based on the elevated chloride concentrations observed during the preliminary

investigation. One monitoring well will serve as an upgradient location and will likely be completed at the eastern extent of the spring, which is the least likely location for impacts based on data collected during the preliminary investigation. One monitoring well will be located immediately adjacent to the spring discharge point, the most likely location for impacts to be observed. The remaining monitoring well will be located northwest of the spring to determine if groundwater impacts are present downgradient. Groundwater flow direction is most likely to the north-northwest according to information provided in the October 2002 *Aquifers of Coke County* report that was created for Coke County Underground Water Conservation District.

- One monitoring well will be installed near the Paragon Corporation, Salmon No. 1, salt water disposal facility (SWDF) to investigate the SWDF as a potential source of elevated chlorides.

- One monitoring well will be installed downgradient of the SWDF in the general area between the Colorado River and the north end of May's Ranch Creek. This location was selected based on elevated chloride concentrations determined during the preliminary investigation at sample locations MR-CREEK-2 and MR-SEEP-1, which seem to be downgradient of the SWDF.

- One monitoring well will be installed on the south (upgradient) end of the Wendkirk Oil Field to evaluate groundwater concentrations in an area with no known oil and gas historical activities.

- Three monitoring wells will be installed north of the Colorado River between river segments 13 and 16 to collect information between the Colorado River and Wendkirk Oil Field. There were no surface water or groundwater sample locations identified in this area during the preliminary investigation.

The two-inch diameter monitoring wells will be installed using an air rotary drill rig. Based on the current knowledge of the site and estimated depths of the water-bearing units, it is assumed that the three monitoring wells surrounding spring 4314102, three monitoring wells north of the Colorado River, and one monitoring well on the north end of the May's Ranch Creek will be installed to an average depth of 30 feet below ground surface (bgs). The single monitoring located next to the SWDF will be installed to a depth of approximately 80 feet bgs because of the higher surface elevation at this location. The single monitoring located on the south end of the Wendkirk Oil Field will be installed to a depth of approximately 100 feet bgs because of the higher surface elevation at this location. The wells will be installed with a

maximum of 20 feet of 0.010-inch machine slot Schedule 40 polyvinyl chloride (PVC) screen. The annular space around the screen will be filled with silica sand to two feet above the well screen. A two-foot thick seal of hydrated bentonite chips will be placed above the sand pack, and the remaining annular space will be filled with a cement-bentonite grout. The PVC well casing will extend two to three feet above grade and will be protected with a steel protective casing and a two foot square concrete pad. The newly installed monitoring wells will be developed upon completion.

Gauging Wells

The depth to groundwater and LNAPL, if present, will be gauged at the nine monitoring wells. The purpose of the data is to determine the presence and extent of any LNAPL, and the groundwater flow direction and gradient. The data will be recorded using an oil-water interface probe capable of distinguishing water and LNAPL elevation measurements to an accuracy of 0.01 feet.

Groundwater Sampling

Groundwater samples will be collected from the nine monitoring wells using disposable PVC bailers. These samples will serve to characterize the COCs in groundwater within the Wendkirk Oil Field. The monitoring wells will be purged using disposable PVC bailers until the field water quality parameters stabilize. For the purposes of this Work Order, all of the groundwater samples will be submitted for laboratory analysis of chlorides by method E300, calcium by method EPA 6020, sulfate by method E300, sodium by method EPA 6020, TDS by EPA 160.1, TPH to C-35 by method TX1005, and BTEX by EPA method 8021. Groundwater samples will be collected in accordance with the *Upper Colorado River Downstream of Spence Reservoir QAPP*.

Quality Assurance/Quality Control Sampling

Field QA/QC samples will be collected as follows: duplicate, matrix spike, matrix spike duplicate, and equipment blank at a frequency of five-percent, and one trip blank for each cooler that has BTEX samples. Field QA/QC samples will be collected in accordance with the *Upper Colorado River Downstream of Spence Reservoir QAPP*.

Surveying

Upon completion of the monitoring well drilling, a survey of the newly installed monitoring wells will be conducted by a local surveying firm. A coordinate survey of the new wells will be completed using a GPS unit. In addition, a GPS unit will be used to survey the

ground and top-of-casing elevation at the nine new monitoring wells to an accuracy of 0.1 feet. The survey will be based on commonly used systems, such as State Plane or Latitude/Longitude for coordinates and National Geodetic Vertical Datum (NGVD) for elevation.

Investigation-Derived Waste (IDW) Disposal

The water from groundwater sampling, well development, and decontamination and miscellaneous IDW (e.g., gloves, bailers) will be staged in 55-gallon steel drums that will be sealed and labeled during the field event. Determination as to whether the waste must be taken to an off-site disposal facility will be made based on the analytical data and communications with RRC representatives. If so, the disposal will be performed upon completion of the second groundwater investigation (Task 8). This work order includes costs for water IDW transportation and disposal assuming classification as oil and gas waste.

Soil cuttings from the well installation will initially be placed on and covered with plastic sheet. If field analytical data indicates no hydrocarbon impacts, then the soil cuttings will be removed from the plastic sheet and spread along the ground surface. Otherwise the soil cuttings will be removed from the plastic sheet and placed in 55-gallon drums for disposal upon receiving the results of the laboratory analysis. This work order includes costs for soil IDW transportation and disposal assuming classification as oil and gas waste.

3.1.7 Task 7: Interim Technical Memorandum

Upon completion of the field activities described in Task 6, the data collected during the seasonal water monitoring events and groundwater investigation event 1 will be evaluated and a brief interim technical memorandum will be prepared. The memorandum will recommend an approach for the second groundwater investigation (Task 8) including proposed monitoring well locations, and recommend any changes, if necessary, to the next seasonal water monitoring event. The memorandum will include tabulated seasonal water and groundwater monitoring analytical results, as well as maps of the water sampling and monitoring well locations, groundwater gradient, and water sample concentrations.

TRC and the RRC will have a meeting to brainstorm the recommendations presented in the memorandum, especially the proposed monitoring well locations, and finalize the approach for the remainder of the investigation. For the purposes of the Work Order, the projected approach and budget for a second groundwater investigation has been included in the subsequent section as Task 8. However, this approach may be modified based on the data collected during Tasks 4 and 6.

3.1.8 Task 8: Groundwater Investigation – Event 2

Information collected during Tasks 4 and 6 may indicate the need for additional groundwater investigation activities. The approach for conducting the second groundwater investigation will be based on the data collected during Tasks 4 and 6 and will be specified in the interim technical memorandum (Task 7). The following scope is projected for the purposes of this work order; however, this approach may be modified based on the data collected during Tasks 4 and 6.

The groundwater investigation consists of several subtasks and is estimated to take seven days to complete. For the purposes of this work order, the scope is estimated to include drilling and installation of up to 11 monitoring wells (7 wells to 30 feet deep and 4 wells to 80 feet deep). Additionally, all of the existing and new monitoring wells (maximum of 20) will be gauged and groundwater sampled. The subtasks are identical to those described in Section 3.1.6 and include utility clearance, marking well locations, drilling soil borings that will be converting into monitoring wells, well gauging, groundwater sampling, surveying, and managing IDW.

3.1.9 Task 9: Investigation Report

Upon completion of the seasonal water monitoring described in Task 4, groundwater investigations described in Tasks 6 and 8, and receipt of the analytical data, an Investigation Report will be prepared. The report will include the following key elements: brief introduction and area description, brief investigation methodology, geology/hydrogeology, results with respect to the objectives in Section 2.2, and conclusions and recommendations for additional investigation and/or remediation, if warranted. Pertinent field measurements and analytical data will be provided in tables. A site figure, sample location map, and additional pertinent figures will be included. The appendices will include copies of the laboratory analytical data with chain-of-custody forms, an analytical data QA/QC review, photographs, electronic versions of the soil boring logs and well construction diagrams, and groundwater sampling field measurements. A draft report will be submitted to the RRC for review, after which a final report incorporating one round of RRC comments will be submitted to the RRC. The report will be sealed by a professional geologist (PG) licensed in the state of Texas.

3.2 Task Personnel and Equipment

The preliminary investigation of the Wendkirk Oil Field includes both office and field efforts. Personnel selected for the project include a Senior Project Manager for technical peer review, review of all submittals, and PG licensing requirements; a Staff Scientist for the coordination of office and field tasks, records review, field investigation, and report production; a Junior Scientist for the records review, field investigation, and report production; Tech/Support

personnel for preparation of drawings and maps, and report production; and, a Junior Tech/Clerk for project administration.

3.3 Task Budget

The total estimated cost for the nine tasks is $167.679.70, with $1,513.55 for the data evaluation meeting (Task 1), $3,559.20 for the seasonal water monitoring work plan (Task 2), $2,541.90 for the records search and review (Task 3), $38,095.20 for the seasonal water monitoring (Task 4), $2,975.20 for the groundwater investigation work plan (Task 5), $47,589.45 for the groundwater investigation – event 1 (Task 6), $3,066.10 for the interim technical memorandum (Task 7), $61,863.70 for the groundwater investigation – event 2 (Task 8), and $6,475.40 for the investigation report (Task 9). A detailed Work Order Cost Breakdown spreadsheet is provided as Attachment 1. All rates shown in Attachment 1 are in accordance with TRC's 2003-2005 and 2005-2007 Professional Services Contracts with the RRC.

3.4 Task Schedule

The projected schedule to complete Tasks one through nine in this Work Order is provided as Attachment 2.

ATTACHMENT 2

PROJECT SCHEDULE

PROPOSED PROJECT SCHEDULE - RRC WENDKIRK OIL FIELD PHASE II INVESTIGATION

Task	Description
1	Data Evaluation Meeting
2	Seasonal Water Monitoring Work Plan
3	Records Search and Review
4	Seasonal Water Monitoring
5	Groundwater Investigation Work Plan
6	Groundwater Investigation - Event 1
7	Interim Technical Memorandum
8	Groundwater Investigation - Event 2
9	Investigation Report

Schedule			
Month 1	**Month 2 and Month 3**	**Month 4**	**Month 5**
June	**July and August**	**September**	**October**
Data Evaluation Meeting	Seasonal Water Monitoring	Seasonal Water Monitoring	Investigation Report
Seasonal Water Monitoring Work Plan	Groundwater Investigation - Event 1	Groundwater Investigation - Event 2	
Records Search and Review	Interim Technical Memorandum		
Seasonal Water Monitoring			
Groundwater Investigation Work Plan			

Actual month assumes approval by RRC no later than May 31, 2006